

Amendments to the Claims

1. (currently amended) ~~A model stored in a memory describing a transcoded video~~ A method for transcoding a video, comprising:
~~a first rate distortion function modeling a requantization of an input video corresponding to the transcoding video;~~
~~a second rate distortion function modeling a resynchronization marker insertion rate for the transcoded video; and~~
~~a third rate distortion function modeling an intra-block insertion rate for the transcoded video~~
modeling a requantization of an input video as a first rate-distortion function of an input video;
modeling a resynchronization marker insertion rate as a second rate-distortion function of the input video;
modeling an intra-block insertion as a third rate-distortion function of the input video; and
transcoding the input video according to the first, second and third rate-distortion functions to produce an output video, in which the input video has a first bit rate greater than a second bit rate of the output video, and a distortion D is expressed as

$$D = \left[\prod_{i=0}^{L-1} \Phi(\omega_i) \right]^{1/L} \cdot e^{-\beta \cdot R(D)},$$

where L is a total number of frequency coefficients of a discrete cosine transform in the input video, $\Phi(\omega_i)$ is a power spectrum density function of coefficient i , R is the second bit rate, and β is $2\ln 2$.

1 2. (currently amended) The ~~model~~ method of claim 1, further comprising:
2 a ~~bit allocation control module configured to receive the input video~~
3 ~~and allocating bits to the transcoded video according to outputs of the first,~~
4 ~~second, and third models~~
5 allocating bits of the input video to the output video according to the
6 first, second, and third rate-distortion models.

1 3. (currently amended) The ~~model~~ method of claim 1, in which the first rate-
2 distortion function outputs a quantization parameter, the second rate-
3 distortion function outputs the resynchronization marker insertion rate, and
4 the third rate-distortion function outputs the intra-block insertion rate.

1 4. (currently amended) The ~~model~~ method of claim 1, in which inter-frame
2 dependencies in the ~~transcoded~~ output video are due to a requantization
3 distortion in a current frame of the ~~transcoded~~ output video that is propagated
4 to a next frame of the ~~transcoded~~ output video through motion compensation,
5 and further comprising:
6 modifying the first rate-distortion model ~~is modified~~ for the next frame
7 to account for propagating the ~~requantizing~~ requantization distortion.

5. (canceled)

6. (canceled)

1 7. (currently amended) The ~~model~~ method of ~~claim 6~~ claim 2, in which β is a
 2 variable, $R(D)$ is replaced by $R^\gamma(D)$, ~~where λ is~~ where γ is a Lagrange
 3 multiplier, and $[\prod_{i=0}^{L-1} \Phi(\omega_i)]^{1/L}$ is replaced by a variance σ^2 , so that the
 4 distortion is

5 ~~$$D = \sigma_k^2 e^{-\beta R^\lambda(D)}$$~~

6
$$D = \sigma^2 e^{-\beta R^\gamma(D)}$$
.

1 8. (currently amended) The ~~model~~ method of claim 7, in which β is in a range
 2 of $[1, 10]$, and γ is in a range of $[0, 1]$, so that the distortion is

3
$$D_0 = \sigma_0^2 e^{-\beta_0 R_0^\gamma},$$

4 where D_0 is a distortion of an intra-coded frame of the ~~transcoded~~ output
 5 video caused by the requantization, and R_0 is the first bit rate.

1 9. (currently amended) The ~~model~~ method of claim 8, further comprising:
 2 ~~means for~~ estimating β and γ from two sample points on the first,
 3 second and third rate-distortion functions.

1 10. (currently amended) The ~~model~~ method of claim 8, in which the
 2 allocating operates on groups-of-frames of the ~~transcoded~~ output video to
 3 account for inter-frame dependencies in the input video due to a
 4 requantization distortion in a current frame of the output video that is
 5 propagated to a next frame of the output video through motion compensation,
 6 and further comprising:

7 ~~means for~~ changing the variance σ_k^2 to σ_k^{*2} to model the inter-frame
 8 dependency, ~~and~~ in which a distortion of requantized inter-frames is

$$D_k = \sigma_k^{*2} e^{-\beta_k R_k^*} = (\sigma_k^2 + \alpha_k D_{k-1}) e^{-\beta_k R_k^*}, \quad k = 1, 2, \dots, N-1,$$

where $\sigma_k^{*2} = \sigma_k^2 + \alpha_k D_{k-1}$, ~~and $D_k = 1$~~ D_{k-1} denotes a quantization residue error produced when a previous frame of the input video is requantized with a larger quantization-scale, α_k denotes a propagation ratio, which is determined by an amount of motion compensation, ~~and $\alpha_k D_{k-1}$~~ models the inter-frame dependency between the current and the previous frame, and N is a total number of frames in a group-of-frames.

11. (currently amended) The ~~model~~ method of ~~claim 1~~ claim 2, in which the bits allocated for inserting the resynchronization markers ~~is~~ are determined from a number of bits in a resynchronization header and a resynchronization marker spacing, and the bits allocated for inserting the intra-blocks ~~is~~ are determined from ~~an~~ the intra-block insertion rate and an average rate increase by replacing inter-coded block with intra-blocks.